Title of Material: _____

Publisher: _____

Reviewer: _____

Percentage of Standards: _____

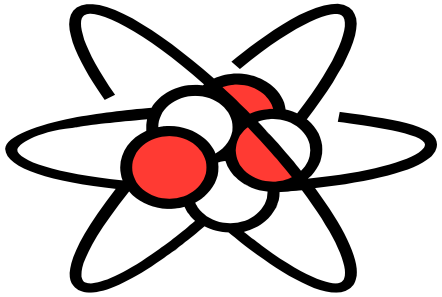
Grades Nine through 12--possible 96 (content knowledge & skills)
(Number of Yes checks divided by 96 = percentage)

Idaho Achievement Standards

Science

for

Grades Nine through Twelve



647 SCIENCE STANDARDS – GRADES 9 THROUGH 12, SECTIONS 648 THROUGH 658.

648 UNIFYING CONCEPTS OF SCIENCE.

Standard – The student will:	Content Knowledge and Skills:	YES	NO
01. Understand systems, order, and organization	a. Know the scientific meaning and application of the concepts of system, order, and organization.	**Indicate Page No**	
02. Understand concepts and processes of evidence, models, and explanation.	a. Know that observations and data are evidence on which to base scientific explanations.	**Indicate Page No**	
	b. Use models to explain how things work.	**Indicate Page No.**	
	c. Develop scientific explanations based on scientific knowledge, logic and analysis.	**Indicate Page No.**	
03. Understand constancy, change, and measurement.	a. Identify constancy in some concepts in science that do not change with time such as the speed of light.	**Indicate Page No**	
	b. Recognize that change occurs in and among systems and change can be measured.	**Indicate Page No**	
	c. Measure in both the metric and U.S. customary system.	**Indicate Page No**	
04. Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.	a. Know that the present arises from materials and forms of the past.	**Indicate Page No**	
	b. Understand evolution as a series of changes, some gradual and some sporadic, that account for present form and function of objects, organisms, and natural or mechanical systems.	**Indicate Page No**	
	c. Know that equilibrium is a physical state in which forces and changes occur in opposite and offsetting directions.	**Indicate Page No**	
05. Understand concepts of form and function.	a. Know that form refers to function and function refers to form.	**Indicate Page No**	

649 CONCEPTS OF SCIENTIFIC INQUIRY.

Standard – The student will:	Content Knowledge and Skills:	YES	NO
01. Understand scientific inquiry and develop critical thinking skills.	a. Identify questions and concepts that guide scientific investigations.	**Indicate Page No**	
	b. Design and conduct scientific investigations.	**Indicate Page No**	
	c. Use technology and mathematics to improve investigations and communication.	**Indicate Page No**	
	d. Formulate and revise scientific explanations and models using logic and evidence.	**Indicate Page No**	
	e. Recognize and analyze alternative explanations and models.	**Indicate Page No**	
	f. Communicate and defend a scientific argument.	**Indicate Page No**	
	g. Know the differences among observations, hypotheses, and theories.	**Indicate Page No**	

650 CONCEPTS OF PHYSICAL SCIENCE

Standards - The student will:	Content Knowledge and Skills:	YES	NO
01. Understand the structure of atoms.	a. Know the function and location of protons, neutrons, and electrons.	**Indicate Page No**	
	b. Understand the processes of fission and fusion.	**Indicate Page No**	
	c. Know the characteristics of isotopes.	**Indicate Page No**	
	d. Know the basic electrical properties of matter.	**Indicate Page No**	
02. Understand the structure and function of matter and molecules and their interactions..	a. Know how atoms interact with one another by transferring or sharing electrons.	**Indicate Page No**	

	b. Know how bonds between atoms are created when electrons are shared or transferred to form molecules or ionic substances.	**Indicate Page No.**	
	c. Know how the physical properties of compounds reflect the nature of the interactions among its molecules.	**Indicate Page No.**	
	d. Know how solids, liquids, and gases differ in the energy that bonds them together.	**Indicate Page No.**	
03. Understand chemical reactions.	a. Know that chemical reactions may release or consume energy.	**Indicate Page No.**	
	b. Know that chemical reactions can occur in the time periods that vary from very fast to very slow and that catalysts can affect the rate of a chemical reaction.	**Indicate Page No.**	
	c. Identify chemical reactions that are occurring all around us.	**Indicate Page No.**	
04. Understand concepts of motion and forces.	a. Know that gravitational force and electrical force are universal forces.	**Indicate Page No.**	
	b. Know that objects change their motion only when a net force is applied.	**Indicate Page No.**	
	c. Understand that moving electrical charges produce magnetic forces, and moving magnets produce electrical forces.	**Indicate Page No.**	
05. Understand that the total energy in the universe is constant.	a. Understand that energy can be transferred but it can neither be destroyed nor created.	**Indicate Page No.**	
	b. Know that energy can be classified as either potential energy, kinetic energy, or energy contained by a field.	**Indicate Page No.**	
	c. Know that heat is evidenced by random motion and the vibrations of atoms, molecules, and ions.	**Indicate Page No.**	
	d. Know that energy is transferred by various types of waves and by electrons flowing through matter.	**Indicate Page No.**	

651 CELLULAR AND MOLECULAR CONCEPTS..

Standards - The student will:	Content Knowledge and Skills:	YES	NO
01. Understand the cell is the basis of form and function for all living things and how living things carry out their life functions.	a. Know that cells have particular structures that underlie their functions.	**Indicate Page No**	
	b. Know that most cell functions involve chemical reactions.	**Indicate Page No**	
	c. Know that cells store and use information in the form of DNA to guide their functions.	**Indicate Page No**	
	d. Know that cell functions are regulated by expressed genes that provide code for the synthesis of proteins.	**Indicate Page No.**	
	e. Know that cellular differentiation is regulated through the expression of different genes. A single cell can differentiate to form the many specialized cells, tissues and organs.	**Indicate Page. No.**	
02. Understand the form and function of DNA.	a. Know that the instructions for specifying the characteristics of the organism are carried in DNA.	**Indicate Page No.**	
	b. Know that genetic information is both encoded in genes and replicated.	**Indicate Page No.**	
	c. Know that most of the cells in a human contain 23 pairs of chromosomes, and that transmission of chromosomal information to offspring occurs through the combination of egg and sperm cells.	**Indicate Page No.**	
	d. Know that changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism whereas others can change cells and organisms. Only mutations in gametes can create the variation that changes an organism's off-spring.	**Indicate Page No.**	
	e. Know that DNA plays a major role in health issues. Through the development of new technologies we have discovered new information about the human genome, medical disorders, and forensic sciences.	**Indicate Page No.**	

652. INTERDEPENDENCE OF ORGANIZMS AND BIOLOGICAL CHANGE.

Standards - The student will:	Content Knowledge and Skills:	YES	NO
01. Understand the theory of biological evolution	a. Know that the theory of evolution explains how species evolve over time and how evolution is the consequence of interactions of: -Potential of a species to increase its numbers; -Genetic variability -A finite supply of resources; -Selection by the environment of those offspring better able to survive and leave offspring.	**Indicate Page No**	
	b. Know that natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of organism.	**Indicate Page No**	
	c. Know that the theory of evolution explains how different species of plants, animals, and microorganisms that live on earth today are related by descent from common ancestors.	**Indicate Page No**	
	d. Know that biological classifications are based on similarities, which reflect their evolutionary relationships.	**Indicate Page No.**	
02. Understand the interdependence of organisms.	a. Know that atoms and molecules cycle among the living and nonliving components of the biosphere.	**Indicate Page No.**	
	b. Trace energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.	**Indicate Page No.**	
	c. Know that organisms both cooperate and compete in ecosystems.	**Indicate Page No.**	
	d. Know that living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.	**Indicate Page No.**	
	e. Know that human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption.	**Indicate Page No.**	

653. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.

Standard – The student will:	Content Knowledge and Skills:	YES	NO
01. Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.	a. Know that all matter tends toward more disorganized states.	**Indicate Page No**	
	b. Know that living systems require a continuous input of energy to maintain their chemical and physical organization.	**Indicate Page No.**	
	c. Know that the energy for life is primarily derived from the sun through photosynthesis.	**Indicate Page No.**	
	d. Understand cellular respiration and the synthesis of macromolecules.	**Indicate Page No.**	
	e. Know that chemical bonds of food molecules contain energy, which is released when the bonds are broken.	**Indicate Page No.**	
	f. Know that cells usually store energy as Adenosine Triphosphate (ATP).	**Indicate Page No.**	
	g. Know that the distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy.	**Indicate Page No.**	
	h. Trace how matter cycles and energy flows through different levels of organization of living systems – cells, organs, organism, communities – and between living systems and the physical environment.	**Indicate Page No.**	
02. Understand the individual behavior of organisms and their interactions in populations and communities as influenced by physiological and environmental factors.	a. Know that multi-cellular animals have nervous systems that generate behavior	**Indicate Page. No.**	
	b. Know that the nerve cells communicate with each other by secreting specific excitatory and inhibitory molecules.	**Indicate Page. No.**	
	c. Know that organisms have behavioral responses to internal changes and to external stimuli. The broad patterns of behavior have evolved to ensure reproductive success.	**Indicate Page No.**	
	d. Know that behaviors often have an adaptive logic when viewed in terms of natural selection.	**Indicate Page No.**	

654. EARTH AND SPACE SYSTEMS.

Standard – The student will:	Content Knowledge and Skills:	YES	NO
01. Understand scientific theories of origin and subsequent changes in the universe and earth systems.	a. Know that current scientific theory suggests that the Sun, the Earth, and the rest of the solar system formed from a nebular cloud of dust and gas.	**Indicate Page No**	
	b. Know methods used to estimate geologic time (observing rock sequences and using fossils to correlate the sequences at various locations).	**Indicate Page No**	
	c. Know that interactions among the solid earth, the oceans, the atmosphere, and organisms have resulted in the ongoing change of the earth system. Some activities are observable (earthquakes and volcanic eruptions) but many take place over hundreds of millions of years.	**Indicate Page No**	
	d. Know that the development of life caused dramatic changes in the composition of the earth's atmosphere.	**Indicate Page No.**	
	e. Know that the universe is constantly expanding.	**Indicate Page. No.**	
	f. Know the life history of stars and galaxies.	**Indicate Page No.**	
02. Understand geo-chemical cycles and energy in the earth system.	a. Know that earth systems have internal and external sources of energy, both of which create heat. The sun is the major external source of energy.	**Indicate Page No.**	
	b. Know that the two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy from the earth's original formation.	**Indicate Page No.**	
	c. Know that the outward transfer of earth's internal heat drives convection circulation in the mantle that propels the plates comprising the earth's surface across the face of the globe.	**Indicate Page No.**	
	d. Know that the heating of the earth's surface and atmosphere by the sun drive convection within the atmosphere and oceans, producing winds and oceans currents.	**Indicate Page No.**	
	e. Know that global climate is determined by energy transfer from the sun at and near the earth's surface.	**Indicate Page No.**	
	f. Know that the movement of matter through the solid earth, oceans, and atmosphere is driven by the earth's internal and external sources of energy. These movements are often accompanied by a change in the physical and chemical properties of matter.	**Indicate Page No.**	

655. TECHNOLOGY.

Standard – The student will:	Content Knowledge and Skills:	YES	NO
01. Understand the relationship between science and technology and develop the abilities of technological design and application.	a. Know the ways that science advances technology and technology advances science.	**Indicate Page No**	
	b. Recognize that science and technology are pursued for different purposes and that scientific inquiry is driven by the desire to understand the natural world and technological design is driven by the need to meet human needs and solve human problems.	**Indicate Page No**	
	c. Know that critical thinking, creativity, imagination, and a good knowledge base are all required in the work of science and engineering.	**Indicate Page No**	
	d. Know the elements of technological design, which include the following: -Identify a problem or design an opportunity; -Propose designs and choose between alternative solutions; -Implement a proposed solution; -Evaluate the solution and its consequences; -Communicate the problem, process, and solution.	**Indicate Page No.**	
	e. Use available technology to assist in solving problems.	**Indicate Page No.**	

656. PERSONAL AND SOCIAL PERSPECTIVES.

Standard – The student will:	Content Knowledge and Skills:	YES	NO
01. Understand common environmental quality issues, both natural and human induced.	a. Identify issues, including but not limited to: -Water quality; -Air quality; -Hazardous waste; -Forest health.	**Indicate Page No**	
02. Understand the causes and effects of population change.	a. Understand the impact of technological development and the growth of human population on the living and nonliving environment.	**Indicate Page No**	
	b. Understand the impact of population change on natural resources and community infrastructure.	**Indicate Page No.**	

03. Understand the importance of natural resources and the need to manage and conserve them.	a. Understand the differences between renewable and nonrenewable resources.	**Indicate Page No**	
	b. Understand the differences between preservation and conservation.	**Indicate Page No**	
	c. Understand the role and effect of management of natural resources.	**Indicate Page No.**	
04. Understand different uses of technology in science and how they affect our standard of living.	a. Identify examples of technologies used in scientific fields, including but not limited to: -Weather forecasting; -Food production; -Environmental cleanup; -Advances in medicine; -Communications; -The space program.	**Indicate Page No**	

657. HISTORY OF SCIENCE

Standard – The student will:	Content Knowledge and Skills:	**YES**	**NO**
01. Understand the significance of major scientific milestones.	a. Understand the social and economic impact of historical scientific events.	**Indicate Page No**	
	b. Understand the contributions of notable scientists.	**Indicate Page No.**	

658. INTERDISCIPLINARY CONCEPTS.

Standard – The student will:	Content Knowledge and Skills:	**YES**	**NO**
01. Understand that interpersonal relationships are important in scientific endeavors.	a. Know the importance of working in interdisciplinary teams to solve scientific problems.	**Indicate Page No**	
02. Understand technical communication.	a. Read for information.	**Indicate Page No**	
	b. Write and articulate technical information	**Indicate Page No.**	